FIG. 1

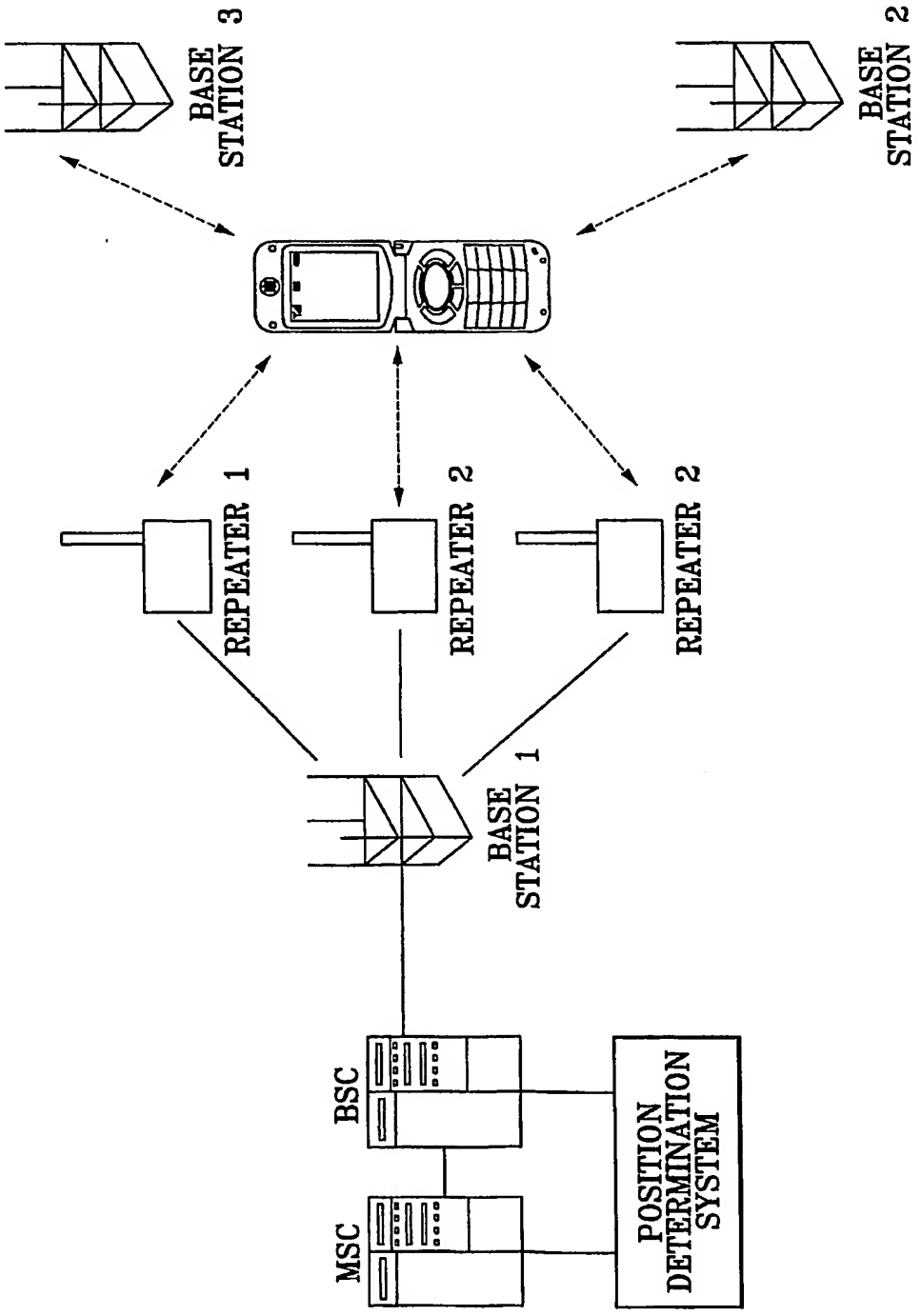

BASE STATION 3
BASE STATION 2
REPEATER 1
REPEATER 2
REPEATER 2
BASE STATION 1
BSC
MSC
POSITION DETERMINATION SYSTEM

FIG. 2

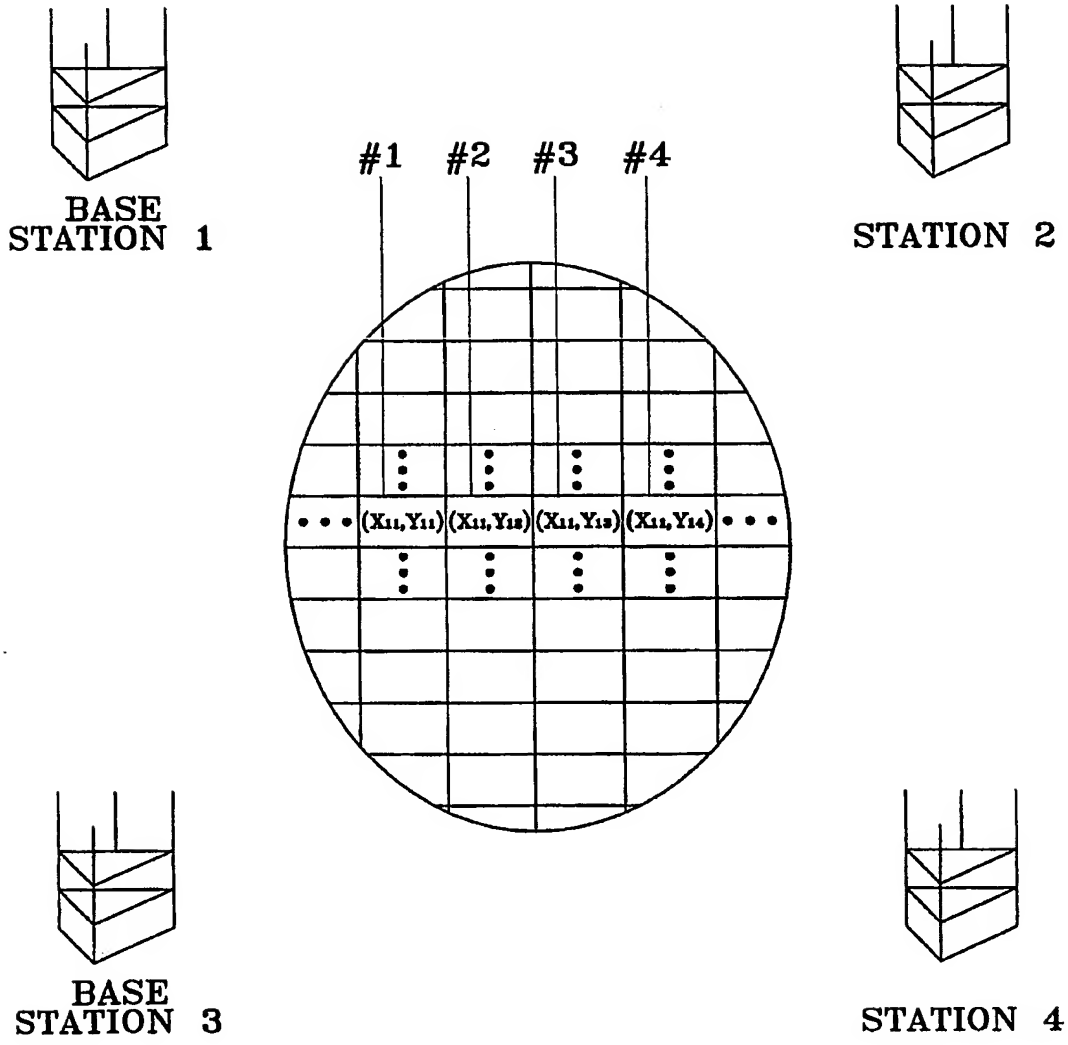

BASE STATION 1
STATION 2
#1
#2
#3
#4
(X11,Y11)
(X11,Y12)
(X11,Y13)
(X11,Y14)
BASE STATION 3
STATION 4

FIG. 3

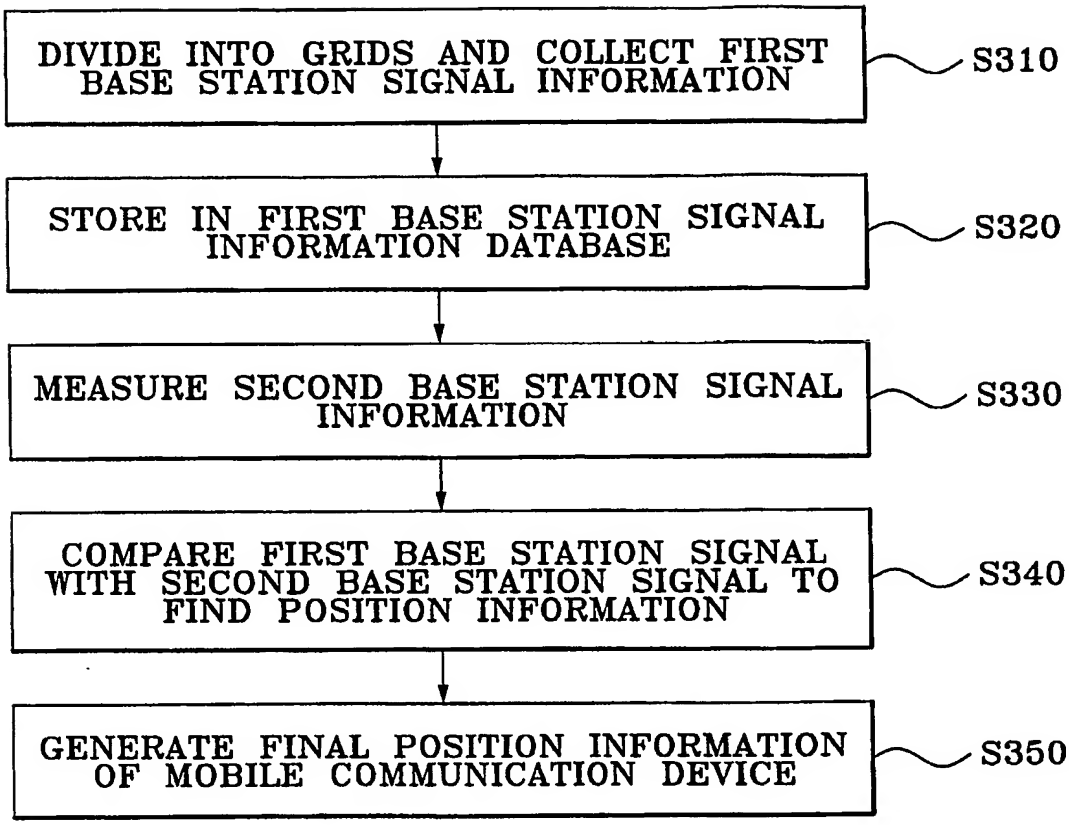
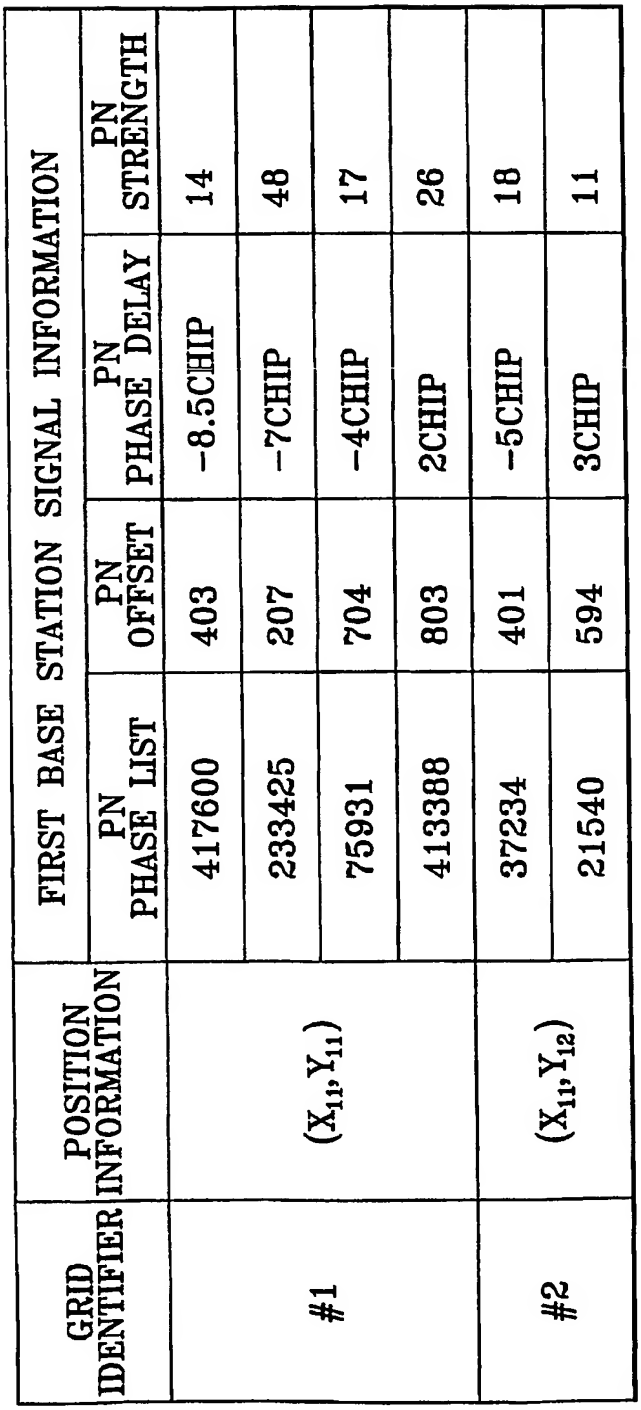

DIVIDE INTO GRIDS AND COLLECT FIRST BASE STATION SIGNAL INFORMATION
S310
STORE IN FIRST BASE STATION SIGNAL INFORMATION DATABASE
S320
MEASURE SECOND BASE STATION SIGNAL INFORMATION
S330
COMPARE FIRST BASE STATION SIGNAL WITH SECOND BASE STATION SIGNAL TO FIND POSITION INFORMATION
S340
GENERATE FINAL POSITION INFORMATION OF MOBILE COMMUNICATION DEVICE
S350

FIG. 4

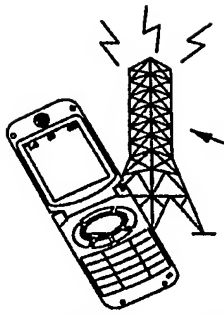


GRID IDENTIFIER	POSITION INFORMATION	FIRST BASE STATION SIGNAL INFORMATION			
		PN PHASE LIST	PN OFFSET	PN PHASE DELAY	PN STRENGTH
#1	(X_{11}, Y_{11})	417600	403	-8.5CHIP	14
		233425	207	-7CHIP	48
		75931	704	-4CHIP	17
		413388	803	2CHIP	26
#2	(X_{11}, Y_{12})	37234	401	-5CHIP	18
		21540	594	3CHIP	11

FIG. 5

PN PHASE	PN OFFSET (① +512)/ 1024	PN PHASE DELAY ①-(②×1024)	PN PHASE DELAY RELATIVE PHASE DIFFERENCE ③-⑦	PN PHASE	PN OFFSET (⑤ +512)/ 1024	PN PHASE DELAY ⑤-(⑥×1024)
①	②	③	④	⑤	⑥	⑦
28457	28	-215	45	44796	44	-260

FIG. 6



(72. 208. −12)
(44. 244. 46)
(54. 72. 22)

(X_{11}, Y_{11})

(72. 208. −12) (44. 244. 46) (54. 72. 22) (LAT. LONG)=(X_{11},Y_{11})	(44. 114. −17) (100. 408. 56) (58. 97. −10) (45. 64. 48) (LAT. LONG)=(X_{12},Y_{12})	(72. 244. 55) (58. 32. −10) (LAT. LONG)=(X_{13},Y_{13})
(54. 32. −22) (44. 82. 34) (58. 64. −24) (336. 212. 60) (LAT. LONG)=(X_{21},Y_{11})	(54. 244. −32) (44. 72. −30) (88. 54. 68) (44. 408. 10) (64. 244. 40) (LAT. LONG)=(X_{21},Y_{12})	(344. 512. −70) (65. 96. 12) (LAT. LONG)=(X_{21},Y_{13})
(62. 84. −82) (96. 383. −120) (62. 74. 45) (LAT. LONG)=(X_{31},Y_{11})	(44. 72. 10) (344. 408. 211) (58. 67. 24) (74. 412. 25) (LAT. LONG)=(X_{31},Y_{12})	(33. 204. 100) (112. 408. −5) (LAT. LONG)=(X_{31},Y_{13})

FIG. 7

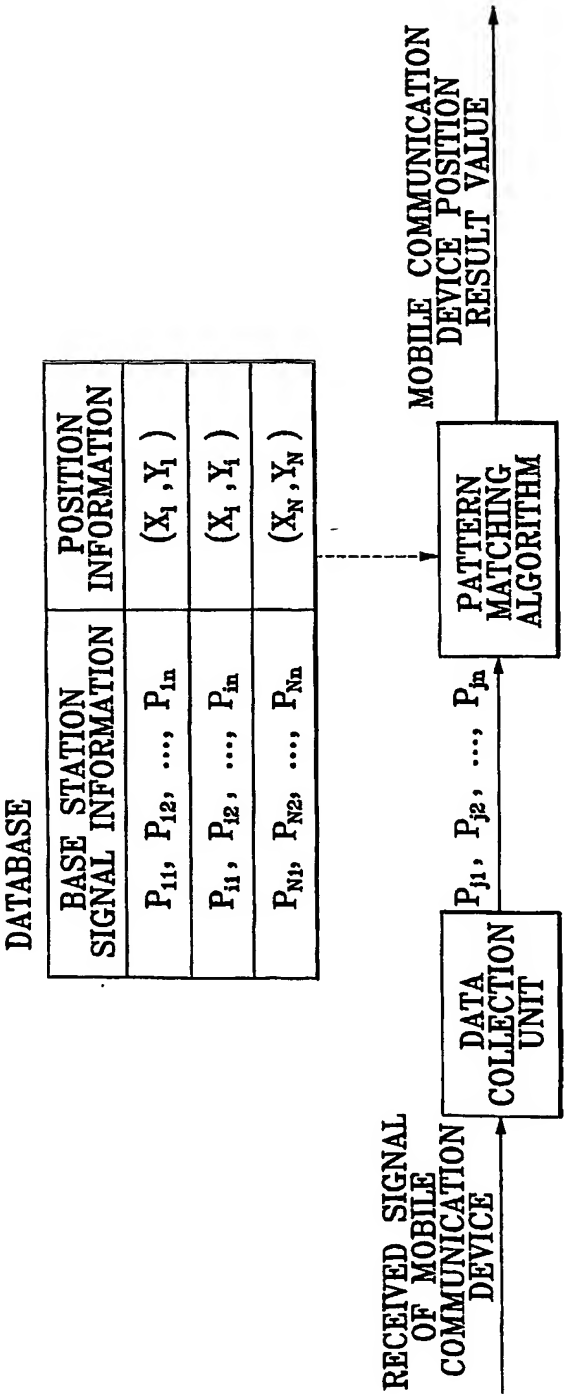

DATABASE
BASE STATION SIGNAL INFORMATION
POSITION INFORMATION
P_{11}, P_{12}, ..., P_{1n}
(X_1, Y_1)
P_{i1}, P_{i2}, ..., P_{in}
(X_i, Y_i)
P_{N1}, P_{N2}, ..., P_{Nn}
(X_N, Y_N)
PATTERN MATCHING ALGORITHM
MOBILE COMMUNICATION DEVICE POSITION RESULT VALUE
P_{j1}, P_{j2}, ..., P_{jn}
DATA COLLECTION UNIT
RECEIVED SIGNAL OF MOBILE COMMUNICATION DEVICE

FIG. 8

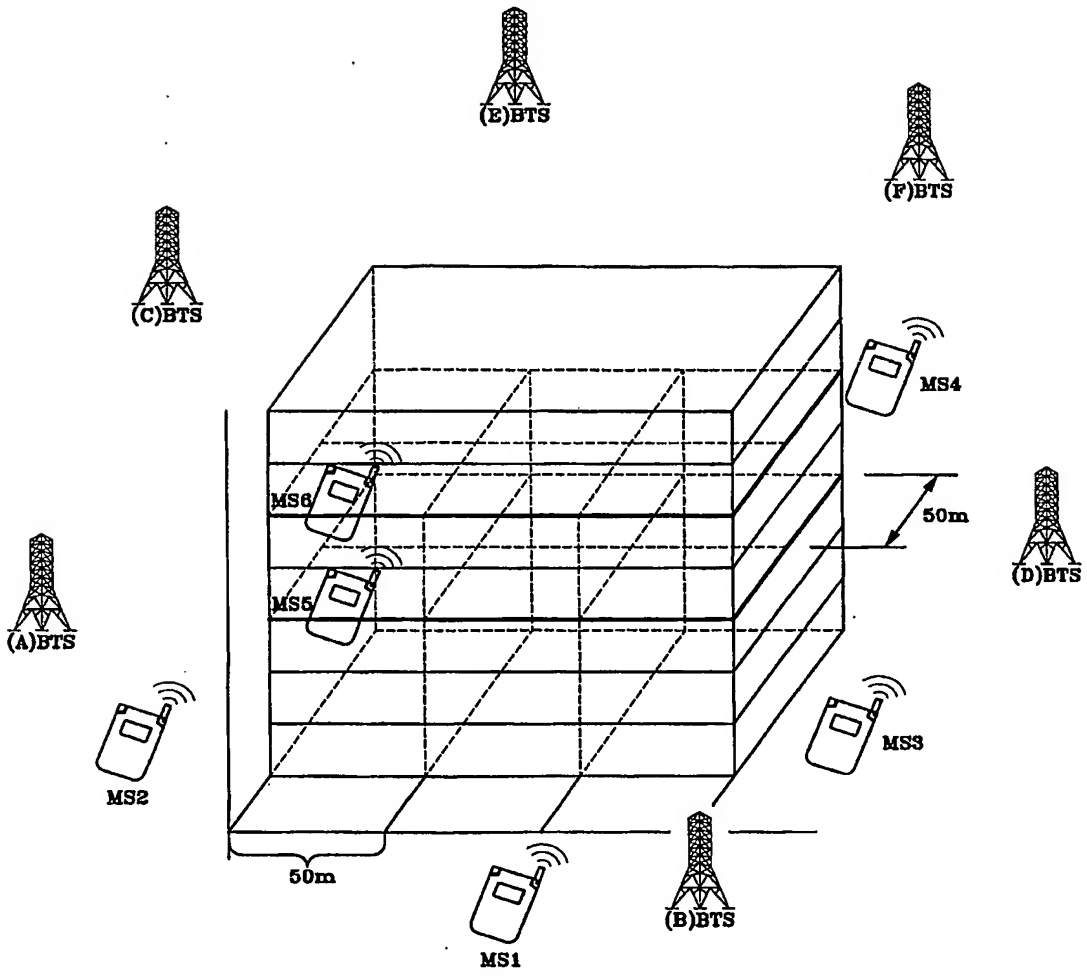


FIG. 9

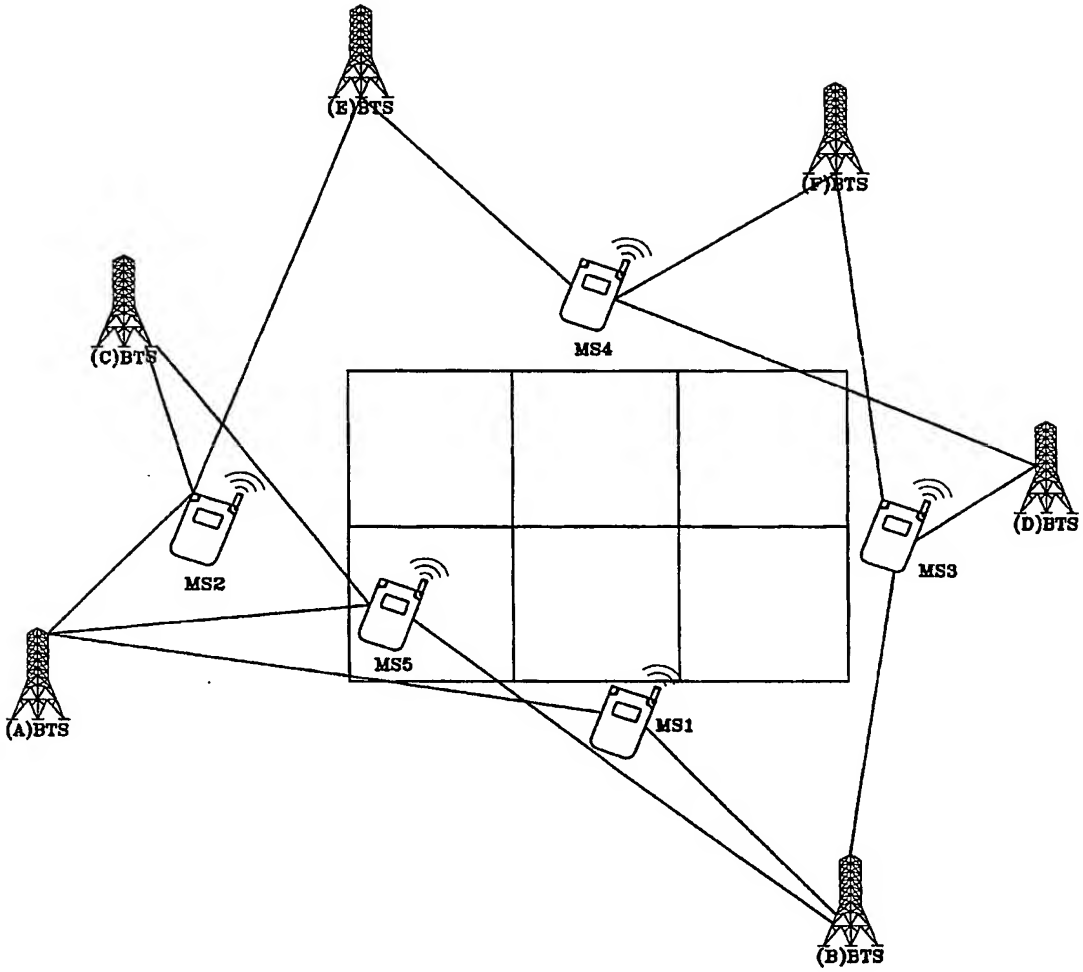


FIG. 10

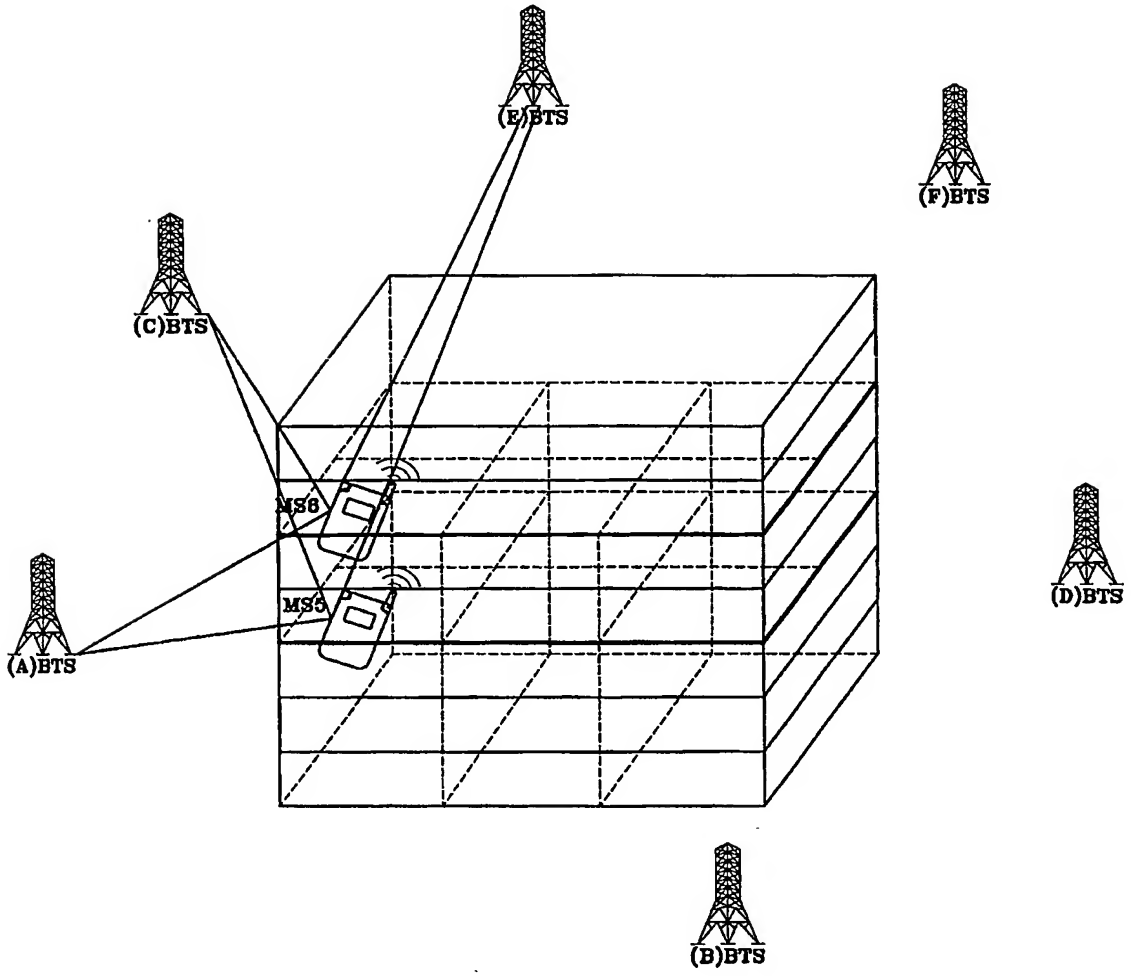


FIG. 11

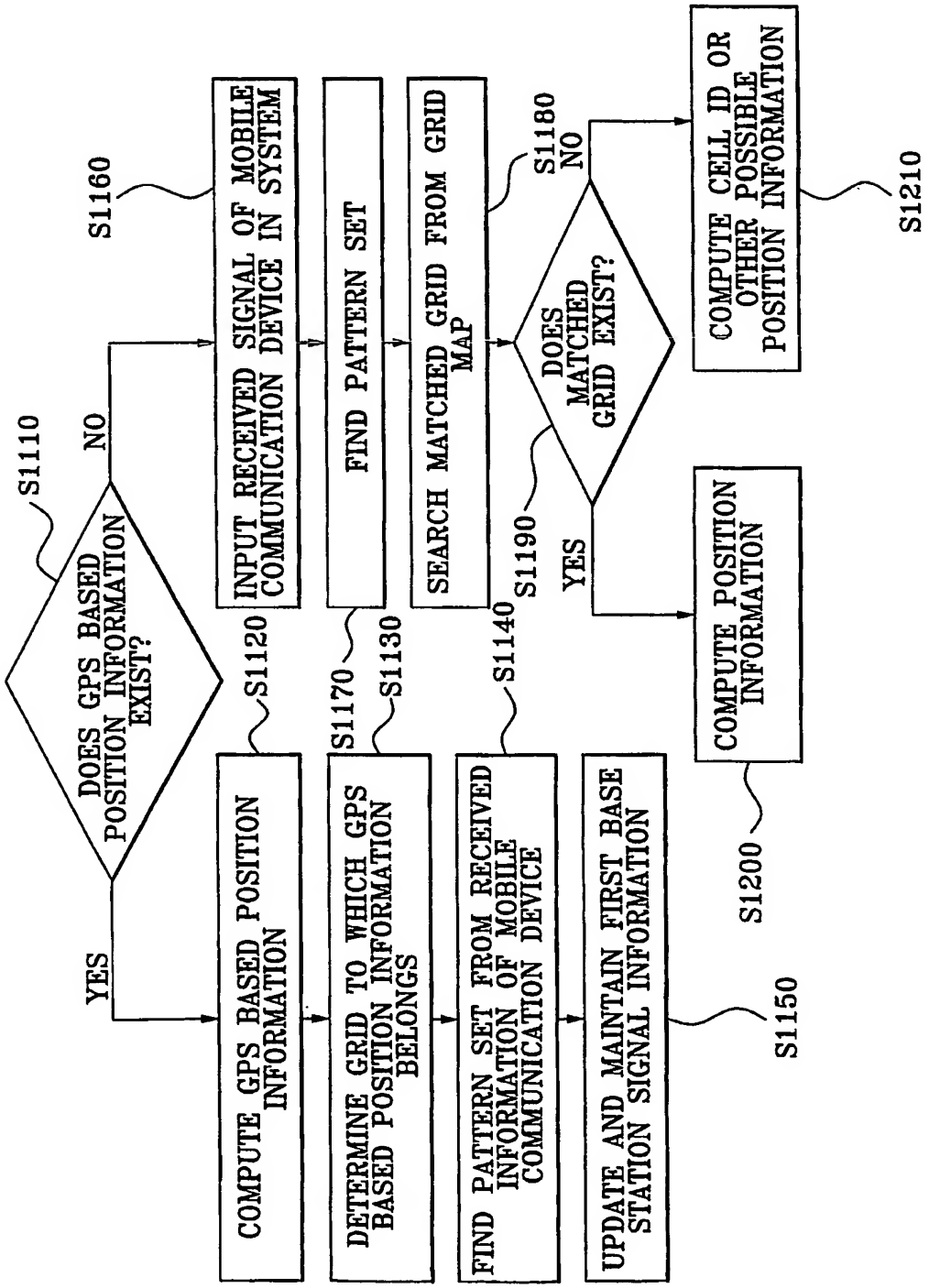

S1110
DOES GPS BASED POSITION INFORMATION EXIST?
YES
NO
S1120
COMPUTE GPS BASED POSITION INFORMATION
S1130
DETERMINE GRID TO WHICH GPS BASED POSITION INFORMATION BELONGS
S1140
FIND PATTERN SET FROM RECEIVED INFORMATION OF MOBILE COMMUNICATION DEVICE
S1150
UPDATE AND MAINTAIN FIRST BASE STATION SIGNAL INFORMATION
S1160
INPUT RECEIVED SIGNAL OF MOBILE COMMUNICATION DEVICE IN SYSTEM
S1170
FIND PATTERN SET
S1180
SEARCH MATCHED GRID FROM GRID MAP
S1190
DOES MATCHED GRID EXIST?
YES
NO
S1200
COMPUTE POSITION INFORMATION
S1210
COMPUTE CELL ID OR OTHER POSSIBLE POSITION INFORMATION

FIG. 12

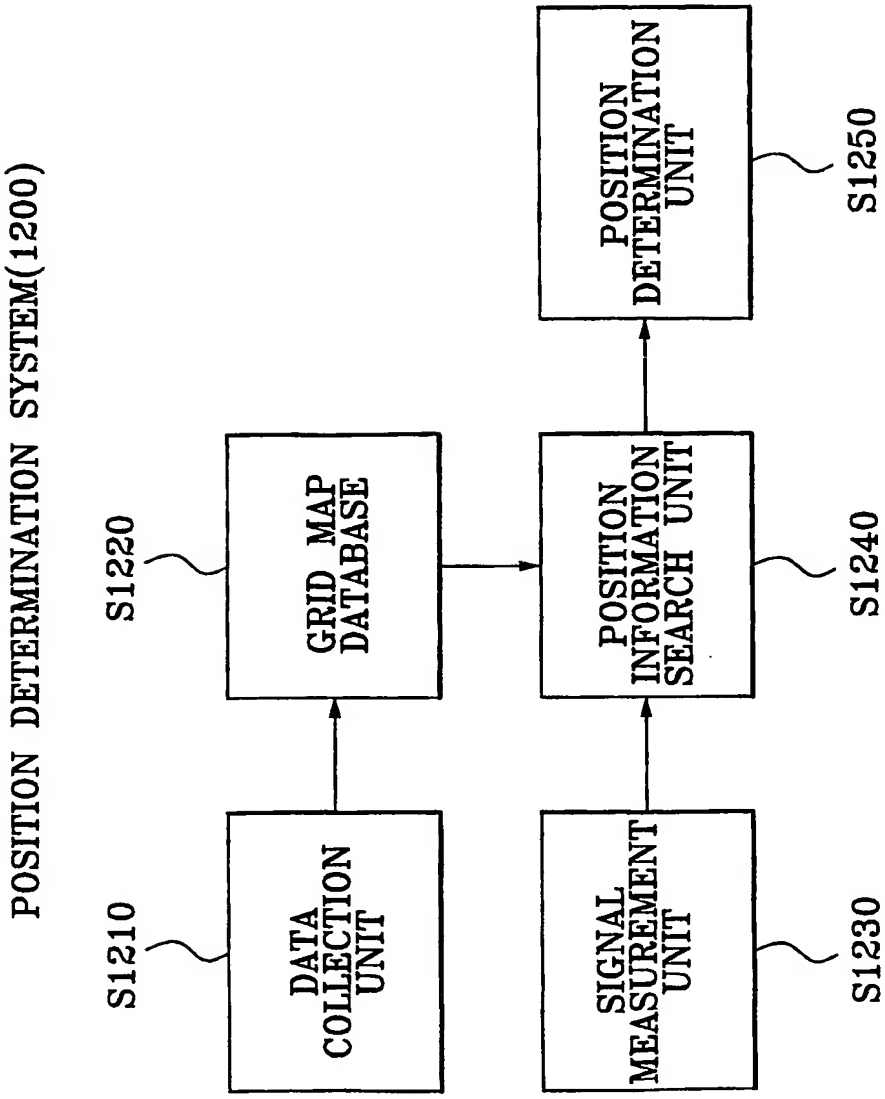

POSITION DETERMINATION SYSTEM(1200)
S1210
DATA COLLECTION UNIT
S1220
GRID MAP DATABASE
S1230
SIGNAL MEASUREMENT UNIT
S1240
POSITION INFORMATION SEARCH UNIT
S1250
POSITION DETERMINATION UNIT

FIG. 13

BASE STATION ID	PN PHASE DELAY	PN STRENGTH
417605	-11.7 CHIP	14
450395	-5.7 CHIP	34
294596	-3.7 CHIP	56

FIG. 14

SIGNAL INFORMATION COLLECTED FROM CERTAIN BUILDING FOR EACH BASE STATION		BASE STATION SET	POSITION OF BASE STATION AND REPEATER	LATITUDE AND LONGITUDE FOR EACH CERTAIN BUILDING	ADDRESS FOR EACH CERTAIN BUILDING
BASE STATION A	(BASE STATION ID, RANGE OF PN PHASE DELAY, RANGE OF PN STRENGTH)	A	(LATITUDE, LONGITUDE)	(LATITUDE, LONGITUDE)	IL-YANG BUILDING 206 NONHYUN-DONG, KANGNAM-GU, SEOUL
BASE STATION B	(BASE STATION ID, RANGE OF PN PHASE DELAY, RANGE OF PN STRENGTH)	B	(LATITUDE, LONGITUDE)		
BASE STATION C	(BASE STATION ID, RANGE OF PN PHASE DELAY, RANGE OF PN STRENGTH)	C	(LATITUDE, LONGITUDE)		
BASE STATION F	(BASE STATION ID, RANGE OF PN PHASE DELAY, RANGE OF PN STRENGTH)	F	(LATITUDE, LONGITUDE)	(LATITUDE, LONGITUDE)	BAE-YANG BUILDING 875-21 BANGBAE-DONG SEOCHO-GU, SEOUL
BASE STATION K	(BASE STATION ID, RANGE OF PN PHASE DELAY, RANGE OF PN STRENGTH)	K	(LATITUDE, LONGITUDE)		
BASE STATION L	(BASE STATION ID, RANGE OF PN PHASE DELAY, RANGE OF PN STRENGTH)	L	(LATITUDE, LONGITUDE)		

FIG. 15

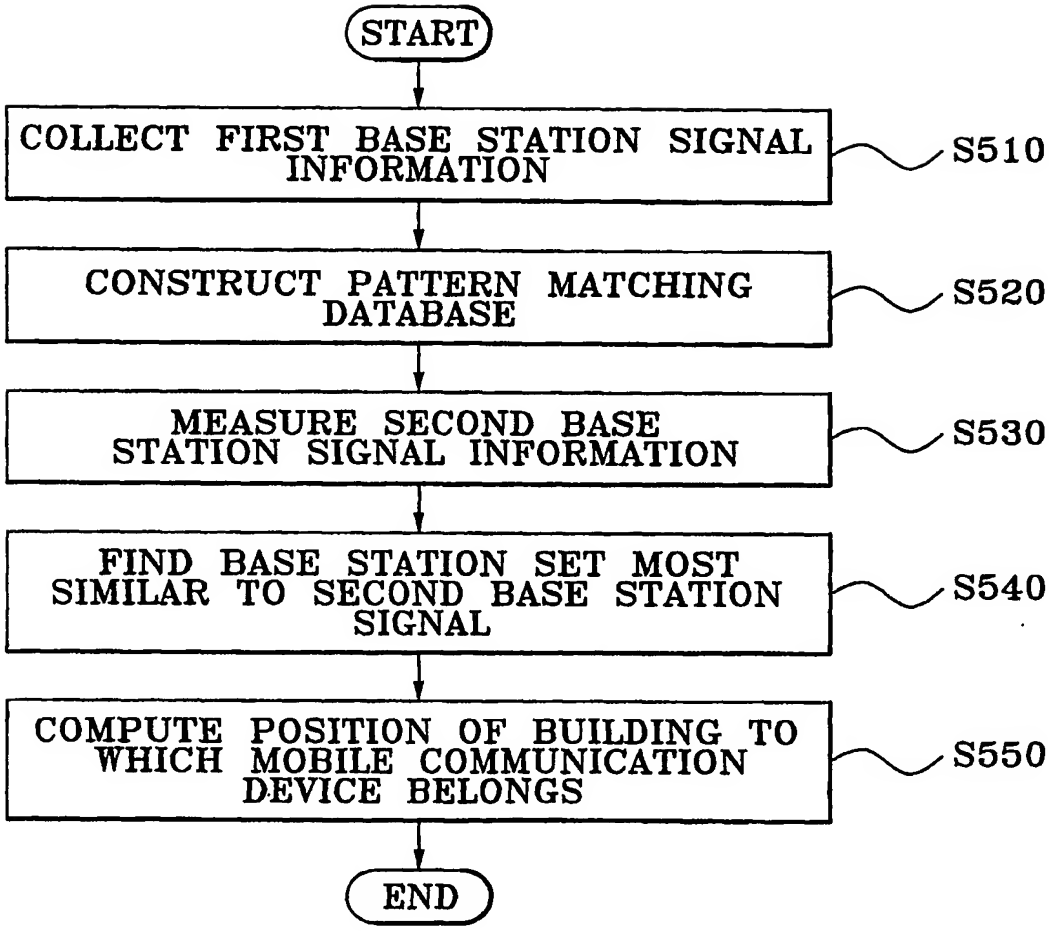
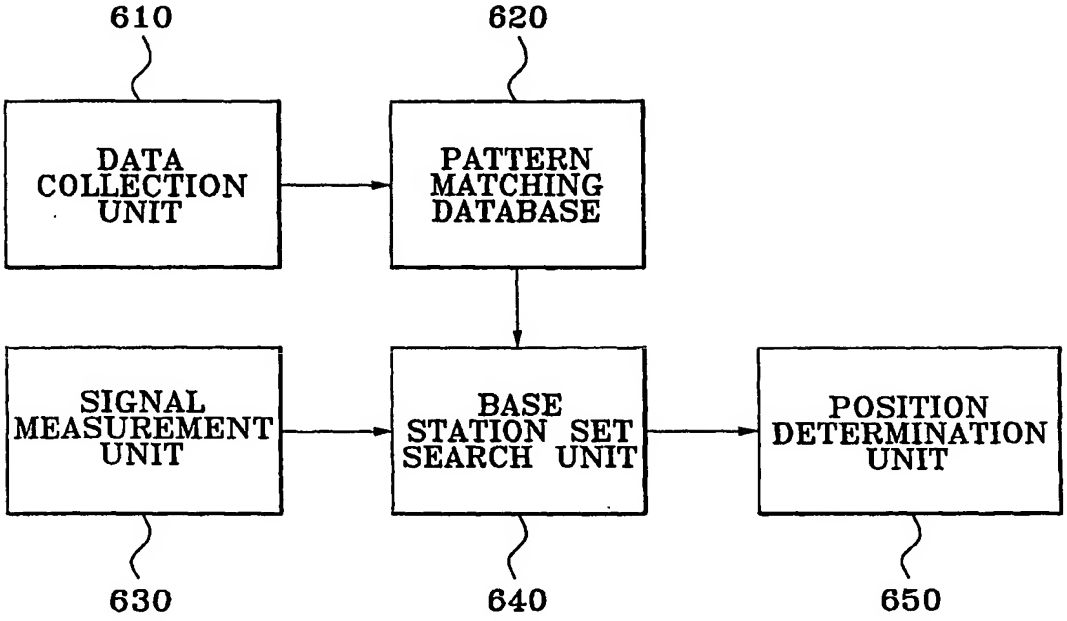

START
COLLECT FIRST BASE STATION SIGNAL INFORMATION
S510
CONSTRUCT PATTERN MATCHING DATABASE
S520
MEASURE SECOND BASE STATION SIGNAL INFORMATION
S530
FIND BASE STATION SET MOST SIMILAR TO SECOND BASE STATION SIGNAL
S540
COMPUTE POSITION OF BUILDING TO WHICH MOBILE COMMUNICATION DEVICE BELONGS
S550
END

FIG. 16


610
620
DATA COLLECTION UNIT
PATTERN MATCHING DATABASE
SIGNAL MEASUREMENT UNIT
BASE STATION SET SEARCH UNIT
POSITION DETERMINATION UNIT
630
640
650